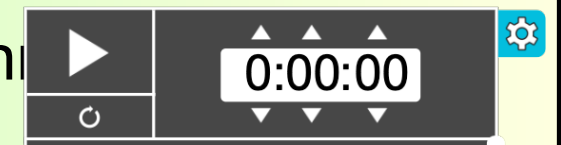


Circuits	Potential dividers and sensing circuits
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Learning objectives	MUST (6)	Recall and apply the rule for potential divider circuits
	SHOULD (7)	Understand the effects of loading a potential divider
	COULD (8/9)	Explain how sensing circuits can be constructed and used

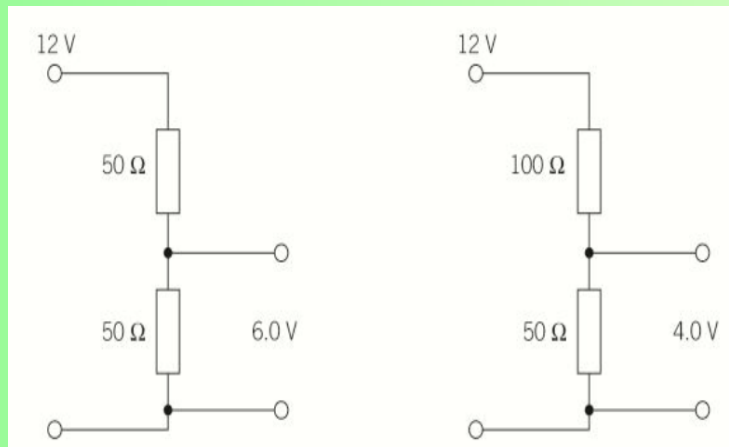
STARTER: You have a 24V power supply and three resistors, 10Ω , 60Ω and 110Ω . You set up a circuit, using only two resistors. What is the minimum and maximum potential difference you can get across one of the resistors?

EXTENSION: Does the answer change if you can use all three?



MUST (6)

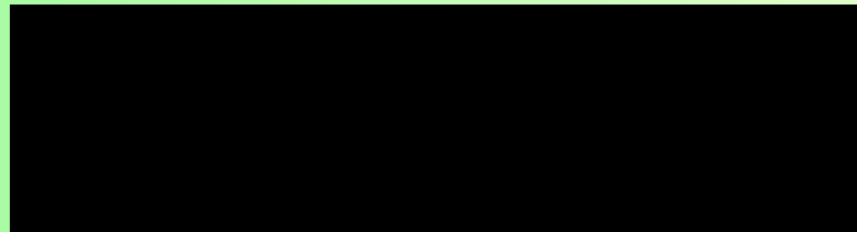
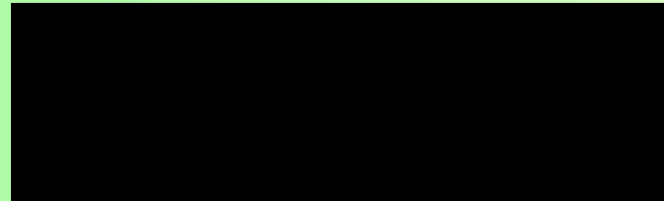
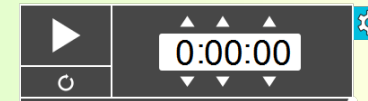
Recall and apply the rule for potential divider circuits



Potential divider equation: p.d. across R_2 :

$$V_{out} = \left(\frac{R_2}{R_1 + R_2} \right) \times V_{in}$$

12V supply: $R_1 = 80\Omega$, $R_2 = 6\Omega$. What is the p.d. across R_2 ?

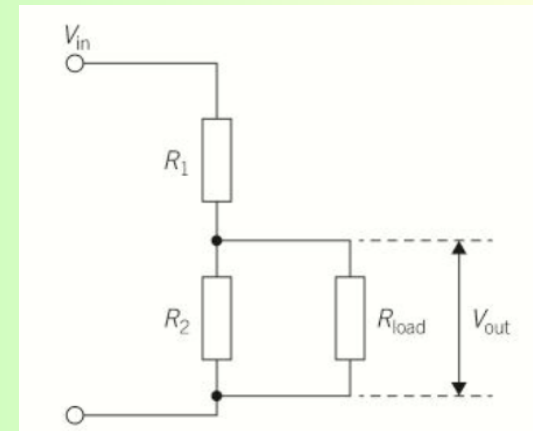


SHOULD (7) Understand the effects of loading a potential divider

Loading a potential divider refers to connecting a component across V_{out} .

When the load is added on the right, what happens to V_{out} ?

Extension: what makes more difference: adding a high R_{load} or a low R_{load} ?

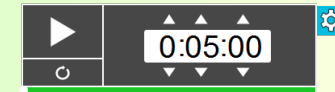
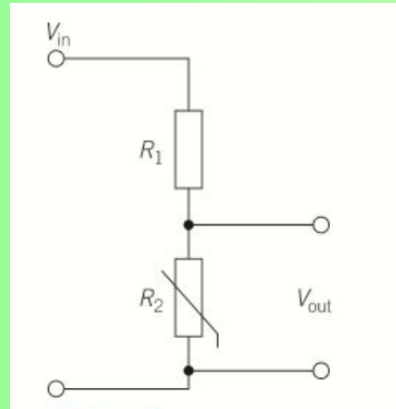


- 2** A $2.2 \text{ k}\Omega$ resistor and a $4.7 \text{ k}\Omega$ resistor are connected as part of a potential divider circuit to a 12 V supply. V_{out} is connected across the $4.7 \text{ k}\Omega$ resistor. Calculate V_{out} when
- a** the potential divider is not loaded
 - b** the potential divider is loaded with a resistor of resistance $10 \text{ k}\Omega$
 - c** the potential divider is loaded with a resistor of resistance 100Ω .

COULD (8/9)

Explain how sensing circuits can be constructed and used

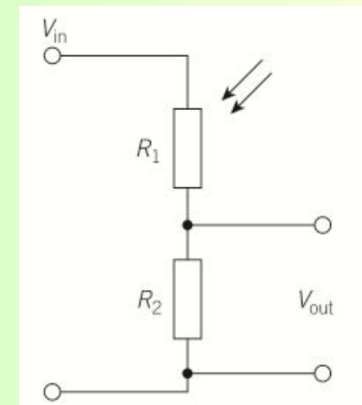
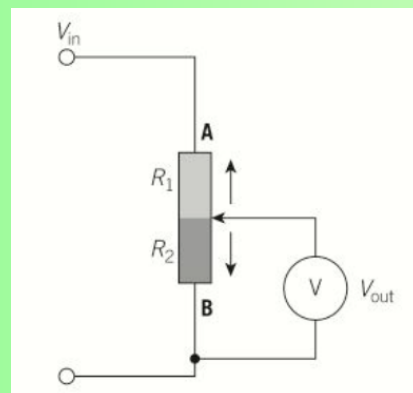
If a potential divider circuit is set up with one component that varies according to the environment, the p.d. across the component and the other resistor will vary.



As temperature increases...?

What if you wanted to change the circuit so that the opposite happens?

As it gets darker, what happens to V_{out} ?



Potentiometers are a form of potential divider: instead of changing resistors, a sliding control is used to adjust proportions of R_1 and R_2 .

This uses fewer components and easily allows the full range adjustment to be made.

Circuits	Potential dividers and sensing circuits
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Learning objectives	MUST (6)	Recall and apply the rule for potential divider circuits
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PLENARY: In a sensing circuit like the one on the right, why might you replace the resistor R_2 with a variable resistor?

